ATTACHMENT 49

DEPARTMENT OF HEALTH & HUMAN SERVICES
Public Health Service

Food and Drug Administration
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Document Control Center - WO66-G609
Silver Spring, MD 20993-0002

K143619/S002
Rebotix, LLC
Remanufactured EndoWrists

June 23, 2015

Device Description

1. You state that the subject device is reusable (for 11 additional uses), is provided non-sterile to the user, and must be cleaned and sterilized before the first and each subsequent use. However, there is no description of any of the cables used with the electrosurgical devices. We note that page 24 of the Instructions for Use states, "The PK Instrument Cords are reusable for a maximum of twenty (20) reuse cycles. Therefore, it is not clear if any of the cords for the electrosurgical instruments are included in the submission and, if so, how they are remanufactured or reprocessed by Rebotix, how they will be supplied to the end user, and how they will be reprocessed by the end user. If the cords are included in the submission, please provide all details regarding the device description, remanufacturing process, validated reprocessing instructions for users, and validated number of use lives, or a method to assess the cord's end of life based on simulated use/reprocessing followed by performance testing.

Remanufacturing

The following deficiencies refer to the procedures you have identified to collect used devices from users, and modify those devices to accommodate additional uses (defined as "remanufacturing" for the purpose of this letter).

2. Although the subject device is not a "single-use device" (defined as a device used only once and then discarded), it has many aspects in common with third party reprocessed single-use devices. Therefore, it is recommended that you review and provide the following items described in FDA's Guidance "Medical Device User Fee and Modernization Act of 2002, Validation Data in Premarket Notification Submissions (510(k)s) for Reprocessed Single-Use Medical Devices," (available at http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm071434):

    a. Cleaning Agent Characterization

    b. Process and Equipment Characterization

        i. Cleaning process tolerances have not been described, nor have quality control tests or equipment specifications. It is recommended that the tolerances for each cleaning process be provided in a tabular format that

lists the minimum, maximum, and nominal values for each relevant parameter.

c. Risk Analysis

d. Process Validation that includes Installation Qualification (IQ), Operational Qualification (OQ) and Performance Qualification

   i. It does not appear that the cleaning processes described in the remanufacturing procedures have been validated.

   ii. In addition, the IQ and OQ for the sterilization process have not been provided.

e. Routine Monitoring and Control

f. Assessment of Change

   i. Procedures to track changes that occur with the original equipment manufacturer (OEM) device as well as OEM reprocessing changes should be implemented. Please refer to Deficiencies 3b, 35a, 39, and 42b for more information.

3. In Attachment D of Supplement 2, you provide the protocols for your remanufacturing procedures. Please revise the protocols as described below and provide a copy with your response.

   a. Protocol PR3034, Autoclave Sterilization, appears to include non-discrete temperatures and times (e.g., temperature ranges, minimum exposure times) for steam sterilization. Please revise the procedures under PR3034 to include discrete temperatures and times that match your sterilization validation activities. Please also see Deficiency 14h below for similar issues regarding non-discrete values in the reprocessing instructions.

   b. Protocol PR3043, Incoming Evaluation, states that candidates for remanufacture are evaluated for acceptance. Please address the following concerns regarding this protocol:

      i. There is no explanation of how clinical soil on the received devices will be assessed and any related acceptance criteria. It is not clear if devices shipped from the health care facilities will be reprocessed before shipping or if they are shipped dirty. Please clarify these issues and revise your Incoming Evaluation protocol to include inspection criteria related to soil. The incoming acceptance criteria should be based on the results from your cleaning and sterilization validation studies, which should demonstrate that clinically used devices with worst case soiling (as

determined from a Native Soil Characterization Study) can be effectively cleaned and sterilized. Please see related Deficiencies 18 and 19 regarding the Native Soil Characterization Study for more information.

ii. It does not appear that you have methods in place to track OEM device and reprocessing changes. Please revise your Incoming Evaluation protocol to include acceptance criteria for OEM device changes and reprocessing changes that are acceptable or not acceptable. FDA expects that you collect and track information from the health care facilities and only accept devices that fit within the scheme of devices that were validated for remanufacturing; this information should also be stated in the labeling (please see related Deficiency 5 below). For example, if OEM devices that were reprocessed by cleaning, disinfection AND sterilization were not included in your verification and validation testing, then these devices should not be accepted for remanufacturing since it could affect the use life, safety, and effectiveness of the device. It is also expected that this tracking be an ongoing monitoring procedure that is in place.

iii. Please revise your Incoming Evaluation protocol to include a criterion for previously remanufactured devices, including an explanation for how these devices are identified and that they will not be forwarded to the next remanufacturing step.

c. Protocol PR3033, Disassembly and Salvage, states that the small bearing and large bearing should be re-lubricated if necessary. However, it is not clear what these components are and if they are patient-contacting (including indirect patient contact due to cleaning fluid contact and travel down the instrument). In addition, it is not clear what lubricant is applied and what tolerance ranges apply to the application of the lubricant. Finally, it is not clear if this lubricant was accounted for in the cleaning and sterilization validation studies. Step 6.12 of PR3033 states, "Place the EndoWrist in the ultrasonic bath; refer to PR3036 In-Process U/S Cleaning SOP." Review of PR3036 does not clarify what part of the device is subjected to the cleaning or why this cleaning is performed. Again, it is not clear if these procedures have been accounted for in the cleaning validation studies. Please revise your protocol to clarify these issues, and provide an explanation of whether these lubrication steps have been included in your cleaning and sterilization validation studies. If this lubrication step was not included in your cleaning and sterilization validation studies, please repeat the validation studies to demonstrate that the presence of lubricant does not affect the ability to effectively clean and sterilize the device.

d. Protocol PR3025, Scissors Sharpen and Refurbishment, states that TheraBand is inserted to remove burs from the cutting blades. However, it is not clear what TheraBand is. Please provide a comprehensive description of TheraBand, including its material composition.

e. Protocol PR3050, Final Test, includes visual inspection along with a series of functional tests. However, it does not appear to include a final inspection for visible soil. Please revise the protocol to include a final visual inspection step before component reassembly to assess for any visible soil or other extraneous materials with defined acceptance criteria (e.g., "no visible soil", etc.).

4. In Attachment C of Supplement 2, you provide a table describing the purpose, acceptance criteria, and product specifications for each procedure. However, it does not appear that the cleaning processes have adequate tolerances established. For example, the "Ultrasonic Cleaning & Flush" states a minimum power density of 48 watts/gallon, ultrasonic frequency of 38 kHz or greater, and solution temperature as close to 45°C. Please revise your remanufacturing procedures to have defined tolerance ranges with minimum, maximum, and nominal values for all applicable processes. Also, many of the acceptance criteria listed in Attachment C state that the device must pass a visual inspection. However, it is not clear what the actual pass/fail criteria are for these tests. Please revise Attachment C to explain what the acceptance criteria are for each visual inspection performed.

5. Although you have provided reprocessing instructions to the user, it does not appear that you have provided any instructions on how to ship the used OEM device to you, including whether the user should reprocess the device before shipping or send the device dirty. We note that on page 42 of Module J it is stated, "…the end user is supposed to return equipment sterilized." In addition, the labeling should state which devices are candidates for remanufacture. For example, devices must have one use life remaining, and only devices subjected to a validated list of reprocessing methods should be returned for remanufacturing. Please revise your labeling to include instructions on preparing devices for shipment and which devices are candidates for remanufacture.

6. Numerous recalls for the Intuitive Surgical da Vinci EndoWrists have been identified in the FDA Recalls database (available at http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfRES/res.cfm). Please examine all reports in the FDA Recalls database regarding the da Vinci EndoWrists, and provide a risk analysis to address the issues identified in these recalls. In your risk analysis, please address the risk mitigation measures you have in place for addressing the issues in each recall. Please provide a copy of your risk analysis in your response. In addition, please specifically address the following issues:

   a. You provide a description of the remanufacturing process in Supplement 2, Attachment B. However, it is unclear if or how recalled devices are identified and rejected during the incoming evaluation phase of your remanufacturing process. Please clarify any methods by which recalled devices are identified and rejected as unacceptable candidates for remanufacture.

   b. Numerous reports in the Recalls database (e.g., Z-0435-2015, Z-0439-2015, etc.) describe EndoWrist products that were recalled since "Deviations in reprocessing

steps from those stated in the reprocessing instructions can cause surface degradation of the housing and/or accelerate mechanical wear of the instrument." These recalls underscore the importance of tracking the reprocessing history of all incoming devices (i.e., tracking how these devices were reprocessed by the previous end user prior to re-manufacture). Please see Deficiency 3b for more information regarding this matter.

c. Several reports in the Recalls database (e.g., Z-1965-2014, Z-0258-2008, etc.) describe products that were recalled due to incorrect labeling (e.g., either on the device housing or in the User Manual). These recalls led to changes to the device labeling. Please describe any methods you have in place for tracking changes to the OEM labeling and incorporating these changes into the subject device labeling.

d. Several reports in the Recalls database (e.g., Z-0520-2014, Z1442-2013, etc.) describe products that were recalled due to potential for device failure (e.g., potential for jaw detachment or device cracks, etc.). These "potential failures" may not be evident in new devices; rather, the probability of these failures increases over the course of the device's lifetime as the number of uses increases. Please identify any methods you have in place for identifying and mitigating the risk of these potential device failures following remanufacture of your subject devices.

Labeling

The following deficiencies refer to the proposed labeling you have provided, and include general labeling concerns along with concerns regarding your proposed reprocessing instructions. Please refer to "Device Labeling" (available at http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/Overview/DeviceLabeling/ucm2005422.htm) for general labeling concerns, and the guidance document, "Reprocessing Medical Devices in Health Care Settings: Validation Methods and Labeling Guidance for Industry and Food and Drug Administration Staff" (available at http://www.fda.gov/downloads/medicaldevices/deviceregulationandguidance/guidancedocuments/ucm253010.pdf), for concerns regarding reprocessing information.

7. You provide the Instructions for Use (IFU) for the subject device through email on May 22, 2015. However, the Indications for Use in the subject IFU differs slightly from the Indications for Use in the 510(k) Summary and the Indications for Use Form. The following sentence is omitted from the Indications for Use in the subject IFU, but is present in the 510(k) Summary and Indications for Use Form:

   "The Instrument is for use only with the Intuitive da Vinci S and da Vinci Si Systems (Endoscopic Instrument Control System)."

   Please revise the Indications for Use so that it is identical across the labeling, 510(k) Summary, and Indications for Use Form and provide a copy of the revised documents in your response.

8. Protocol PR3027, Housing Labeling, states that Rebotix branding will be laser engraved onto the housing of all remanufactured instruments. However, you have not provided any images of how the engraving will appear. Please provide images of all laser engravings that will be added to the device housing. Please also see related Deficiency 11c below.

9. In the cleared predicate IFU in K063220, the following contraindication is listed as a general contraindication for all EndoWrist devices:

> "This instrument may only be used on soft tissue. Do not use it on cartilage, bone or hard objects. Doing so may damage the instrument and make it impossible to remove it from the cannula."

   However, in the subject IFU, this contraindication is only listed for the PK Dissecting Forceps. Please provide a rationale for why this contraindication is only listed for the PK Dissecting Forceps in the subject IFU and not the other device models. Alternatively, please revise the subject IFU so that this contraindication is listed for all EndoWrist devices. Please provide a copy of your revised labeling in your response.

10. The following warning was removed from the subject IFU with respect to the cleared predicate IFU in K063220:

> "Do not remove the cannula and [EndoWrist] instrument simultaneously as this may damage the surrounding tissues and the instrument."

    Since this warning was present in the predicate IFU, please provide a rationale for why it was removed. Alternatively, please add this warning back to the subject IFU, and provide a copy of your revised labeling in your response.

11. You provide the IFU for the subject device through email on May 22, 2015. You state that the IFU was formatted to "…align with the content organization of the OEM IFU." However, the differences identified below were noted between your subject IFU and the OEM IFU. Please provide revised labeling to address these concerns.

    a. Unlike the OEM IFU, the subject IFU does not contain a Table of Contents. Due to the large quantity of information present in the subject IFU, we recommend you to include a Table of Contents in the subject IFU so that the end user can readily access important information.

    b. Page 13 of the OEM IFU contains safety and compatibility information regarding the EndoWrist ProGrasp Forceps. This information includes a list of devices that can be used safely with the ProGrasp Forceps. However, this information is not included in the subject IFU. Since the subject device includes Remanufactured ProGrasp Forceps, please add this information to the subject IFU so that the user can understand how to safely use the Remanufactured ProGrasp Forceps.

c. Page 4 of the subject IFU states, "The remanufactured EndoWrist instruments have a blue housing with the instrument description. They also have the da Vinci S logo prominently displayed on the housing." However, unlike the OEM IFU, a picture of the device housing is not provided in the subject IFU. Furthermore, in Attachment B of Supplement 2, you state, "'Remanufactured By,' the Rebotix Logo, and 'Not Affiliated with Original Manufacturer' are added to the Instrument housing." However, this information is not mentioned in the device housing description provided in the subject IFU. In order to help the user distinguish between remanufactured devices and OEM EndoWrist devices, please provide a picture and description of the Remanufactured device housing in the subject IFU.

d. Page 21 of the OEM IFU contains a list of electrosurgical units (ESUs) and energy activation cables that can be used with the subject device, along with the following associated notes regarding use of the EndoWrist instruments:

    i. "Note: Not all da Vinci and da Vinci S surgical systems are equipped with a bipolar connection and will not be compatible with the above bipolar energy activation cables. Contact your local Intuitive Surgical representative to confirm your system's configuration."

    ii. "Note: The da Vinci S and Si instruments have been evaluated for use only with the above ESU generators, and are compatible only with interconnecting cords and ESU generators that are in compliance with IEC 60601-2-2: 1998, IEC 60601-2-2: 2006, or IEC 60601-2-2: 2009."

    However, this information is not included in the subject IFU. Please note that you provide instructions regarding specific ESUs (e.g., Covidien Force FX-C, ConMed 5000, etc.) in the subject IFU, and this information may appear out of context to the user since a list of compatible ESUs and cables is not provided. Since knowledge of compatible ESUs and cables is necessary for safe and proper use of the subject device, please provide a list of ESUs and energy activation cables that can be used with the subject device, along with their associated warnings.

e. Page 37 of the OEM IFU contains instructions and figures regarding proper installation of the Tip Cover Accessory on the Monopolar Curved Scissors. While the subject IFU contains most of these instructions, it omits the following instruction along with the corresponding figure illustrating this instruction:

    "[The Tip Cover Accessory] is not properly installed beyond the orange surface and over the shaft. This causes a bulge on the shaft and may prevent it fitting through the cannula."

Since this information is essential to safe use of the Monopolar Curved Scissors, please add this instruction to the subject IFU, along with a corresponding figure illustrating this instruction.

f. The following instructions regarding energy activation cables are present in the OEM Manual:

   i. "Note: Energy activation cables are non-sterile and do not require sterilization before use." (page 20 of OEM IFU)

   ii. Cleaning and Storage instructions regarding use of the energy activation cable (pages 31 – 32 of OEM IFU)

   It appears you may have chosen to omit these instructions since energy activation cables do not appear to be part of the subject device. Nonetheless, proper handling of the activation cable is necessary for proper functioning of the subject device. As such, we recommend providing a statement in your IFU referring the user to the OEM IFU for instructions regarding the energy activation cables.

12. You provide the IFU for the subject device through email on May 22, 2015. This IFU contains the following sections:

    Section 1. General Information
    Section 2. Remanufactured EndoWrist Instruments
    Section 3. ESU Settings and Energy Activation Cables
    Section 4. Remanufactured Monopolar Curved Scissors
    Section 5. Remanufactured Permanent Cautery Instruments
    Section 6. Remanufactured Bipolar Instruments
    Section 7. Remanufactured PK Dissecting Forceps
    Section 8. Cleaning and Sterilization of Remanufactured EndoWrist Instruments

    Several of these sections (e.g., Sections 2, 4, 5, 6, 7) include instructions for specific categories of devices. However, since a list of applicable device models is not provided for each section, it is not readily apparent which sections apply to each device model. For example, Section 6 provides instructions for the Remanufactured Bipolar Instruments, but a list of bipolar device models is not provided. Furthermore, it is unclear which sections of the IFU apply to non-energized device models, since the IFU does not include a specific section on remanufactured non-energized devices. It is also unclear if Section 2 only applies to non-energized devices, or if it applies to all EndoWrist models. Please provide a list of applicable device models for each section 2, 4, 5, 6, and 7, so that the user can clearly understand how to use each device model. Please provide a revised copy of your labeling in your response.

13. On pages 1 – 50 of Module D, you provide package labels for the subject device. The symbols utilized in these package labels are defined in the IFU, but not defined in the package labels. Please note that the FDA does not recognize any standalone symbols

except for the "Rx only" symbol. Therefore, please revise your package labels to include textual descriptions for these symbols, placing this description near each symbol as it appears in the labels. Please note that any definitions for symbols used on the package label should be present on the package label and not in the IFU. Please provide a copy of your revised labeling with your response.

For more information on the recognition of symbols in labeling, please see the proposed rule that was issued in the Federal Register on April 19, 2013. This proposed rule may be found online at http://www.gpo.gov/fdsys/pkg/FR-2013-04-19/html/2013-09175.htm.

14. In your email dated May 22, 2015, you provide an IFU for the subject device that includes reprocessing instructions for the end user. In general, it appears that the instructions follow FDA's Guidance Document "Reprocessing Medical Devices in Health Care Settings: Validation Methods and Labeling" issued on March 17, 2015, with the following exceptions noted. Please revise your reprocessing instructions as described below, and provide a clean and redlined (tracked changes) copy of the revised IFU with your response.

    a. Page 6 states, "Clean the instruments immediately after each use. Do not allow debris to dry on or inside the instrument intraoperatively *before* instrument processing. In order to keep the instrument from drying when soiled, keep the instrument in water or an enzymatic bath between the surgical procedure and instrument processing. The instrument may also be flushed through the main flush port with sterile water during use to minimize buildup of internal deposits of bio-material." However, it is not clear if these instructions have been validated, in terms of the number of use lives, based on performance or appearance of corrosion, etc. It is recommended that you revise the instructions in accordance with your validation activities. Please also revise the wording, "water" and "enzymatic bath," to clarify the quality of water and pH of cleaning agent that should be used.

    b. Page 24 states, "The PK Instrument Cords are reusable for a maximum of twenty (20) reuse cycles. Mark the usage tracker on the cord label after each use." If the PK Instrument Cords are not considered part of your submission, please revise the labeling to recommend that the user refer to the OEM labeling for these cables. If they are part of your submission, additional reprocessing instructions should be provided for the PK instrument cord. Please include reprocessing instructions for the end user and also provide a description and image of the usage tracker. Finally, please explain if the tracking marks are able to be removed by reprocessing and whether any special instructions should be provided on what type of marker should be used to mark the usage tracker.

    c. Page 25 contains the following statements that are not adequate in relation to the manufacturer's responsibility to provide validated reprocessing instructions to the user. Please note that validation of the reprocessing instructions is the responsibility of the device manufacturer and not the end user (see Section VII of

the above referenced Reprocessing Guidance). Therefore, please remove the following statements from your labeling:

i. "Cleaning, disinfection, and sterilization of reusable devices are the responsibility of the hospital or site performing the process."

ii. "These steps may need to be adjusted or repeated depending on soiling conditions or specific cleaning equipment used."

d. Page 25 mentions "endoscopes" in the statement, "The process and parameters listed are recommendations for cleaning, disinfecting, and sterilizing the remanufactured EndoWrist instruments, accessories, and endoscopes and have been validated…" However, endoscopes are not included in your current submission. Therefore, please remove this reference to endoscopes from your IFU. In addition, your reprocessing instructions do not appear to include disinfection; therefore, please also remove the reference to "disinfecting" in the referenced statement.

e. Page 25 states, "Examine the device before and after each use. If any abnormality is found, do not use the device." Please revise these instructions to include a description of an "abnormality."

f. Page 25 states, "Note: If Electro Lube anti-charring solution for cautery instruments is improperly applied, those instruments may require additional scrubbing and high-pressure water spray." It is not clear what instructions this note applies to, since the use of Electro-Lube does not appear in the remainder of your reprocessing instructions. The referenced note also does not describe how to properly apply the lubricant or how the user can know the lubricant is "improperly applied." Furthermore, the Electro-Lube lubricant is not mentioned in the predicate reprocessing instructions. Finally, it is does not appear that the referenced note or the general use of Electro-Lube lubricant have been accounted for as part of your "worst case" reprocessing validation protocol design. Please also note that the lubricant manufacturer (Mectra Labs, Inc.) received a warning letter from the FDA on November 14, 2013 warning them that there is no approved pre-market approval application for the Electro-Lube product for the intended use with robotic instruments (http://www.fda.gov/iceci/enforcementactions/warningletters/2013/ucm375446.htm). For these reasons, it is recommended that you remove all references to Electro-Lube lubricant from your labeling.

g. Page 25 states, "Note: Remanufactured EndoWrist instruments have not been validated for compatibility with the optional thermal disinfection cycle on the Medisafe SI PCF system." However, thermal disinfection does not appear to be a step in your reprocessing instructions, and the Medisafe SI PCF is not cleared for the intended use mentioned in your IFU. Therefore, please remove this note from your labeling.

h. Your instructions include temperature ranges and minimum exposure times for your steam sterilization parameters, rather than discrete times and temperatures. For example, page 27 lists the pre-vacuum steam sterilization temperature as "270-272°F (132-134°C)" and lists a "Minimum exposure time for the U.S.: 4 min." Page 27 also includes the warning "Do not sterilize at temperatures over 285°F or 140°C." Please note that the Reprocessing Guidance states "FDA recommends that 'ranges' not be used for defining sterilization cycles (for example, 121°C-132°C and greater or lesser than 4 minutes exposure time), as this implies that all intermediate values have been validated, and that there are FDA-cleared accessories for all intermediate cycles." Please revise your sterilization instructions to include one discrete temperature and exposure time, in accordance with your validation activities. Please note that FDA recommends that steam sterilization cycle parameters be consistent with those listed in Appendix C of the Reprocessing Guidance and ANSI/AAMI ST79:2010 & A1:2010, "Comprehensive Guide to Steam Sterilization and Sterility Assurance in Health Care Facilities."

i. Your instructions include multiple Flush and Rinse steps. Please revise the instructions to include the type/quality and temperature of rinse water to be used in these steps, in accordance with your validation activities. Please note that AAMI TIR34, "Water for the Reprocessing of Medical Devices," recommends that the final rinse water for devices that will contact sterile areas of the body, such as the subject device, use critical water. For "Step 6: Rinse" on page 27, please also revise your instructions to include the duration of rinse and, in particular, how long the user should "…rinse into the area where the instrument shaft enters the housing."

j. "Step 1: Scrub" on page 26 states, "Repeat scrubbing as needed." It is recommended that you revise this statement to specify how the end user is to know that repeated scrubbing is necessary.

k. "Step 8: Lubricate" on page 27 states, "Lubricate the tip and wrist mechanism with a pH-neutral, steam-permeable instrument lubricant per the manufacturer's instructions." Please revise these instructions to include the general type of lubricant the user should use, in accordance with your cleaning and sterilization validation studies (e.g., "water soluble lubricant"). Otherwise, please remove this instruction from the labeling if it has not been validated.

l. It does not appear that your instructions include the number of reuse lives that are validated for each of the device models. FDA is aware that your devices include an Interceptor chip for tracking the number of device uses. However, it may be useful to the end user to include in your Reprocessing Instructions how many times the reusable devices can be reused and a description of the chip tracking mechanism.

m. Your instructions list multiple accessories (e.g., syringe, soft nylon brush) that do not include adequate descriptions such as size/diameter and type of syringe (e.g., Luer). The instructions also list pressure specifications for flushing the flush ports with pressurized water (i.e., "minimum of 30 psi"), but it is not clear how the pressurized water should be introduced into the flush port (e.g., is a type of Luer fitting or other accessory to be used?). Furthermore, it is not clear if you provide these accessories with the device or if the user needs to purchase these supplies themselves. Please revise your instructions to include a complete description of all cleaning accessories and how the user is to obtain these items. Please also include comprehensive instructions on how the user should introduce the pressurized water into the flush ports. Including images of these steps and accessories may be helpful to the user.

Cleaning Validation

The following deficiencies refer to the cleaning validation activities that you have proposed as part of your remanufacturing process and that you are recommending to users in the reprocessing instructions. Please refer to the guidance document, "Reprocessing Medical Devices in Health Care Settings: Validation Methods and Labeling Guidance for Industry and Food and Drug Administration Staff" (available at http://www.fda.gov/downloads/medicaldevices/deviceregulationandguidance/guidancedocuments/ucm253010.pdf), for additional information.

15. In Attachments B and C of Module E, you provide your justification for the "worst case" device models chosen for cleaning validation (i.e., the Monopolar Curved Scissors, Permanent Cautery Spatula, Fenestrated Bipolar Forceps, PK Dissecting Forceps, Large Needle Driver, and ProGrasp Forceps). Your "worst case" analysis outlines a brief description of the tool end design, materials, surface area, and worst case conclusion based on "risk." It appears that the analysis included consideration of the design configuration, number of components, materials of construction, size and density, surface are and porosity, need for disassembly, surface finish or texture, cannulations or lumens, presence of mated surfaces, and ability to be sterilized in a routine cycle. However, your analysis is not sufficient to determine if your justification for the chosen "worst case" models is appropriate in terms of cleaning validation and difficulty of cleaning the device over other models. Please repeat the analysis by including parameters such as the following: instruments that would collect the highest amount of soil in the inner shaft and on the tip, hardest to reach areas to remove soil, smallest spaces between components, and lowest flushing efficiency (e.g., number of cables in the inner shaft, distance between the distal seal and the termination of the flush tube). If any new "worst case" models are identified due to the new analysis, please provide results from cleaning validation performed using these additional models.

16. You provided "Medisafe Cleaning Process Validation" test reports in Attachments E-4 and E-5 of the original submission for analysis of residual protein and total organic carbon (TOC), respectively. It appears that the Medisafe PCF system and the Medisafe 3 E-zyme Triple Enzyme Cleaner were used in the testing. However, it is not clear why

these reports are provided since no automated washer-disinfector, including the Medisafe PCF system is mentioned in your reprocessing instructions. In addition, as noted in the related Deficiency 14g, the Medisafe is not cleared for this intended use. Please explain the purpose of these test reports provided in Attachments E-4 and E-5.

17. On page 7 of Module E, you state that you have utilized 48 test samples (8 of each of the worst case models) in your cleaning validation studies. However, from Table 2 in the cleaning validation test reports, it appears that 18 samples were used in the tests. From Table 2, it also does not appear that each worst case device model was used in each of the three test cycles. It further appears that the control device models did not match the test sample device models. Finally, it is not clear how many and what type of samples were used for the cleaning efficacy study versus the extraction/recovery efficiency study. Please note that FDA expects all worst case device models to be tested in all cleaning cycles and matched with the same model for all controls. In addition, FDA expects the following controls to be included in the study:

    a. Negative device controls should be unsoiled and undergo the same cleaning and extraction as the test devices; the amount of residual soil should be at or slightly above the negative control.

    b. Positive device controls should be soiled with a known amount of soil, but not cleaned, and residual soil extracted; the amount of residual soil should be equivalent to or slightly lower than the amount of soil placed. Soil recovery efficiencies should be calculated and used during the calculations.

    c. Negative sample control in which "extraction" is conducted with no device. This sample is used as a blank.

    d. Positive sample control in which a known amount of soil (at or slightly above the limit of quantitation) is added to an "extraction" with no device; this control addresses interference of the extraction fluid and extraction method with soil detection.

    Please repeat your cleaning validation study with all worst case device models and using appropriate controls. Please also provide a statistical rationale for the sample size chosen in your cleaning validation studies.

18. Your cleaning validation protocol did not explain how the devices were selected for the study. Please revise your protocol to explain how the devices were selected for the study, including their clinical use, remanufacturing and reprocessing. FDA's expectation would be that the devices used in your study are clinically used devices that were found to have worst case native soiling based on your conduction of a Native soil Characterization Study (see below for more information on this suggested study). Please also explain how the clinically used devices were reprocessed, since changes in the OEM's reprocessing instructions could be implemented differently at the health care facilities and have a

significant effect on the validated use lives. Please repeat your cleaning validation study taking into account these issues, and provide detailed methods in your revised test report.

19. Your cleaning validation protocols state that "…the artificial test soil used to inoculate the devices mimicked worst case contaminants (blood and proteins that may come in contact with the devices and remain on the devices after clinical use)." The test devices were soiled using the artificial test soil in order to obtain an average minimum protein level of 115 µg/cm^2 and an average minimum TOC level of 39.1 µg/cm^2 over the soiled surface area of the devices. You further state that "…this protein level is based on study data which quantified worst case soil levels of medical instruments after patient use (Alfa et al., 1999)," and that the "…TOC level is based on a study which quantified worst case soil levels of medical instruments after patient use (Lappalainen, SK; Gomatam SV; and Hichins V. Residual total protein and total organic carbon levels on reprocessed gastrointenstinal (GI) biopsy forceps. J Biomed Mater Res B Appl Biomater 89B:172-176, 2009)."

    Please perform a Native Soil Characterization Study to investigate the amount of soiling present on clinically used EndoWrist devices to determine that the soil constituents and amount of soil are indeed worst case compared to what would be expected clinically. The study should include a quantitative scale to evaluate native soil as well as images of all soiled surfaces (including internal components). It is recommended that only worst case natively soiled devices be used in your cleaning and sterilization validation studies, and that this information then be used to develop your incoming device acceptance criteria. If worst case natively soiled devices were not used in your cleaning and sterilization validation studies, please repeat the studies using worst case soiled devices. Please provide the completely study protocols and reports for the Native Soil Characterization Study and any repeated validation studies with your response.

20. In Figure 1 of your cleaning validation test reports, you provide an image of the device soiling locations. However, the image is not legible. The caption, which is legible, states that the tip of the device was dipped into soil to point A (which appears to be just above the wrist of the instrument) and actuated to the full range of motion. It further states that a lumen cleaning brush was dipped into soil and then threaded into the main flush ports as far as possible. From this limited description, the test soil does not appear to be applied to the devices in a "worst case" simulated use manner, since it did not include injection of artificial soil into inner lumens, handling with soiled and gloved hands, or inoculation of the outer shaft, which would be expected to be soiled by user handling. Please revise your test reports to provide clearer images of all soiling and a comprehensive description of soil inoculation. Please also repeat the cleaning validation with worst case soiling of the device. It may be necessary to extract different parts of the device separately (e.g., tip vs. inner lumen) and calculate the results separately, since the extraction methods may differ, and since including the surface areas of each device component may lead to lowering the calculated residual soil per surface area. For example, including the higher surface areas of the outer shaft that is easier to clean with the harder-to-clean areas may negatively impact the results. Please provide the complete protocol and test reports of any repeated testing with your response, including raw data generated.

21. Your cleaning validation protocols do not appear to include simulated use of the instruments. For the electrosurgical devices, this is especially important since the soil can be baked onto the device, making it harder to clean. Please repeat your cleaning validation studies using devices that were subjected to a series of simulated use and "worst case" reprocessing (i.e., minimum conditions) over the proposed number of use lives at the health care facility, as well as any additional remanufacturing/reprocessing performed at your facility. With your response, please provide a detailed protocol of the methods used for simulated use, along with complete test reports with raw data.

22. In Table 1 of your cleaning validation test reports, you provide the surface area of the device models used in your cleaning validation studies. However, it is not clear how these surface areas were calculated, and which part of the devices were included in the calculation. You state in the Discussion section of the test reports, "Due to large amounts of the Da Vinci Endowrist surface area not making patient contact, only the surface areas of the device that would come in contact with the soil were used in the calculations…[for residual soil]." However, it is not clear what is classified as the patient vs. non-patient contacting portions of the device. In addition, please note that certain non-patient contacting parts of the device may become soiled from user handling. It should also be noted that if the interior of the device is soiled (e.g., the lumen or flush ports), the internal surface area of that device component should be used in the calculations. Please provide a comprehensive description of the surface area calculation and determination of soiled areas. It may be helpful to provide images with your explanation.

23. Your cleaning validation protocols state that the inoculated test samples and positive controls were allowed to dry at room temperature for a minimum of two hours to simulate worst case conditions. Although this treatment appears to be worst case compared to that specified in the Reprocessing Instructions (which state to clean the device "immediately after procedure" and "keep the device in water or an enzymatic bath between the surgical procedure and reprocessing"), it is not clear how this timeframe would be considered "worst case" for the timeframe of soiled instruments being shipped from the health care facility to the Rebotix facility. Please clarify how this timeframe is considered "worst case" with respect to soiled instruments being shipped to the Rebotix facility. If applicable, please provide repeat cleaning validation to reflect a revised "worst case" timeframe with respect to soiled instruments being shipped to the Rebotix facility.

24. Your cleaning validation test reports state, "Worst case cleaning procedures and conditions were used throughout the validation. For example, cleaners and detergents were prepared according to the manufacturer's instructions using the lowest range of concentration recommended (minimum effective concentration). The least effective (lowest) cleaning temperatures, within recommendations, were used for the rinsing and cleaning steps." The cleaning procedures used in your cleaning validation study were compared to the proposed reprocessing instructions, as well as your remanufacturing procedures. However, key details are missing, such that we are unable to determine if "worst case" conditions were used in your validation studies over those specified in your reprocessing instructions and in your remanufacturing procedures. Please provide a

tabular comparison of the cleaning parameters used in their cleaning validation study versus those in the reprocessing instructions and remanufacturing procedures, in order to demonstrate that "worst case" parameters were used in your cleaning validation studies. The comparison should include all relevant cleaning parameters, such as water quality, water pressure, time, temperatures, concentrations, any repeated scrub/rinse steps, detergent type, lubricants, ultrasonic cleaning parameters, etc.

In addition, please provide an explanation of the worst case temperature conditions used for the cleaning agents used in your cleaning validation studies. For example, your protocol states that you used an enzymatic detergent solution of Steris Prolystica 2X Concentrate Enzymatic Cleaner prepared at the lowest recommended concentration of detergent (1/8 oz. per gallon) and temperature (cold water). However, you have not provided information to demonstrate that "cold water" is considered worst case for this cleaning agent nor have you defined "cold water." Please provide a definition of "cold water" along with your explanation of worst case temperature conditions for the cleaning agents used in your cleaning validation studies.

25. It does not appear that the cleaning methods used in your cleaning validation protocols included a lubrication step, which is recommended in your reprocessing instructions, and which appear as part of your remanufacturing procedures. However, it is noted that page 43 (Attachment E: Parts and Materials) of Module E, Sterilization, from your original submission lists "Steris Hinge Free Lubricant." Since there is no further explanation provided with Attachment E, it is not clear what the purpose of this lubricant is, or whether it was included in the cleaning validation studies. Attachment E also lists "Ruhof Surgistain Rust Remover" and many other unknown materials. Please provide a comprehensive explanation of each of these materials and a flow chart of how the device is treated or used with each. Finally, please repeat your cleaning validation studies to ensure that all treatments the device is subjected to during your remanufacturing procedures, or will be subjected to by end-user reprocessing, are accounted for in your studies.

26. From Section 3.0 "Equipment and Materials" of your test reports, it appears that the extraction fluid used in your cleaning validation studies was distilled water, but there is no description of the extraction container. The Agency is concerned that using water as an extraction medium would not adequately extract residual soil from the surface of a complicated device such as the subject device. For example, the tip and lumen contain multiple coiled wires that could trap soil and be difficult to extract. It is suggested that you consider using a surfactant, such as sodium dodecyl sulfate, as an extraction medium, provided that it does not interfere with your endpoint assays. It appears that you have used an exhaustive extraction method for calculating recovery efficiency; however, it is not clear if this method is adequate for this complicated device, especially if the soil is not easily removed by the extraction medium. It also does not appear that your extraction method allows for sampling of the internal structures of the device (e.g., inside the flush ports and tubes and internal lumen).

Please repeat your cleaning validation studies using an extraction method that can adequately extract all complex internal structures that are exposed to soil. Please also perform an additional test to (1) validate your extraction methods by inoculating a known amount of soil in the hardest to reach areas of the device at a low volume/dilute amount below the endpoint acceptance criterion, (2) extract and quantify the soil, and (3) determine how much soil was able to be removed from the device. Finally, please revise all test reports to include a description of the extraction container, extraction temperature, and extraction volume (and device surface area to extraction volume ratio) used in your cleaning validation studies, as well as the raw results for the extraction/recovery efficiency study, including the number of extractions performed in the exhaustive recovery and calculation of the correction factors. It is recommended that the surface area to extraction volume ratios listed in ISO 10993-12:2012 be used in your studies or that you provide a rationale for other ratios used.

27. From the "Equipment and Materials" list in your cleaning validation test reports, it appears that the assay used to detect residual protein was the MicroBCA assay, and that the Hach Reagent Kit and "DRB reactor" were used to detect total organic carbon (TOC). However, you have not provided the assay methods, mechanism of action for detection, the limit of detection, limit of quantitation, or characterization of any interfering substances for either assay. Please revise your cleaning validation test protocols and reports to include this information.

28. In Step 5.15 of your cleaning validation protocol, you state that "…the test samples were visually inspected to ensure the complete removal of soil." However, it is not clear if visual inspection for visible soil was an explicit acceptance criterion for your studies, or what the results of visual inspection were for the test samples and positive and negative controls. Since the subject device has a complicated design that can make cleaning difficult, it is recommended that you use methods to visually inspect all soiled areas of the device, including internal surfaces. To assess whether any visible soil remains on the internal surfaces, it may be possible to use a borescope. It is also recommended to use microscopic visualization of debris on all areas where it is possible to do so. Please repeat your cleaning validation studies, as applicable, to generate this data, and revise all of your cleaning validation protocols and test reports to include your visual inspection acceptance criteria and results.

29. In your cleaning validation test reports, you provide tables to summarize the data for each cleaning cycle. However, no results are provided for several of the test cycles for each assay test method, with no explanation for this missing data. Please revise your test reports to include data for each cleaning cycle to demonstrate reproducibility, and please also explain whether any deviations or failures occurred in any of the cleaning validation testing. In addition, please revise your test reports to include both the corrected (based on % recovery efficiency and related correction factor) and uncorrected raw data from your cleaning validation studies.

30. In the discussion section of your TOC cleaning validation test reports, you provide the following note: "Due to the elevated TOC levels of the negative controls, a baseline

TOC level was used by subtracting the negative control TOC values from the test sample and positive control TOC values. This was done to assure that measurement of the effectiveness of the cleaning process was based only on the reductions in the TOC levels contributed by the test soil applied to the challenged devices and not from interfering substances such as residual detergent or leaching chemicals. After applying the baseline TOC level, all test samples met the acceptance criteria." However, the TOC results from your negative controls are not adequate; neither is the subtraction of these results from the test samples and positive control results. The Agency considers this an inappropriate adjustment of the data and, therefore, it appears that the negative controls and test samples do not meet the acceptance criterion of < 2.2 µg/cm^2 for TOC. It appears that the TOC endpoint assay used in your studies may not be appropriate, or there may be interfering substances present. Please revise your cleaning validation methods to obtain acceptable results that meet at least two quantitative acceptance criteria for residual soil.

Sterilization Validation

The following deficiencies refer to the sterilization activities that you have proposed as part of your remanufacturing process and that you are recommending to users in the reprocessing instructions. Please refer to the guidance document, "Reprocessing Medical Devices in Health Care Settings: Validation Methods and Labeling Guidance for Industry and Food and Drug Administration Staff" (available at http://www.fda.gov/downloads/medicaldevices/deviceregulationandguidance/guidancedocuments/ucm253010.pdf), for additional information.

31. In Attachments B and C of Module E, you provide your justification for the "worst case" device models chosen for sterilization validation (i.e., the Monopolar Curved Scissors, Permanent Cautery Spatula, Fenestrated Bipolar Forceps, PK Dissecting Forceps, Large Needle Driver, and ProGrasp Forceps). Your "worst case" analysis outlines a brief description of the tool end design, materials, surface area, and worst case conclusion based on "risk." It appears that the analysis included consideration of the design configuration, number of components, materials of construction, size and density, surface are and porosity, need for disassembly, surface finish or texture, cannulations or lumens, presence of mated surfaces, and ability to be sterilized in a routine cycle. However, your analysis is not sufficient to determine if your justification for the chosen "worst case" models is appropriate in terms of sterilization validation and difficulty of sterilizing the device over other models. Please repeat the analysis by including parameters such as the following: hard to reach spaces that do not allow for easy steam access, presence of any additional cables that provide crowding for most difficult to reach small spaces and most difficult air removal from the internal shaft, and interfaces of different materials that affect moisture elimination. If any new "worst case" models are identified due to the new analysis, please provide results from sterilization validation performed using these additional models.

32. You provided a sterilization efficacy report in Attachment E-6 of the original submission. However, the following items identified in the test report require additional information:

a. You state in Section 5.0, Validation of Spores, of the test report, "The D-value was no less than 1.0 minute and the population no less than $1.0x10^6$." However, the biological indicator (BI) does not appear to comply with ISO 11138-3: 2006, "Sterilization of health care products – Biological indicators – Part 3: Biological indicators for moist heat sterilization processes." Clause 9.5 of the standard states, "Suspensions, inoculated carriers or biological indicators containing Geobacillus stearothermophilus spores shall have a D_{121} value of $\geq$ 1.5 minutes when tested according to the conditions given in Annex A." Please repeat the sterilization validation using an appropriate BI. In addition, please provide the actual results from the BI validation results since they are not provided in the test report.

b. It appears from your sterilization validation report that the devices were placed into pouches (i.e., "SPSmedical Self-Seal Pouches") and not a sterilization wrap, as recommended in the reprocessing instructions. Please either revise your reprocessing instructions to recommend that an FDA-cleared sterilization pouch be used (in accordance with your sterilization validation study), or provide results from sterilization validation using an FDA-cleared sterilization wrap.

c. Section 7.12 of the test report states that "positive and negative controls were set up"; however, there is no description of the test methods used for the various controls. Please revise the test report to include comprehensive methods for what the controls entailed and how the controls were handled.

d. You perform a "Negative Verification Test" using samples inoculated with $\leq$ 100 spores of *Geobacillus stearothermophilus* and "incubated per USP." The test methods are not entirely clear, and it does not appear that the recommendations in USP <71> "Sterility Tests" were followed. USP <71> states to use a variety microbes that include aerobic bacteria (*Staphylococcus aureus, Bacillus subtilis, Pseudomonas aeruginosa*), anaerobic bacterium (*Clostridium sporogenes*), and fungi (*Candida albicans* and *Aspergillus brasiliensis* (*Aspergillus Niger*)). Please repeat the "Negative Verification Test" using the test methods outlined in USP <71>, and provide a complete description of your test methods in your test report.

e. Your test report does not state how the devices (test samples and controls) were treated prior to the sterilization validation study. Please revise your test report to include this information. Please ensure that all devices used in your sterilization validation studies included all steps in your remanufacturing procedures and all steps in your reprocessing instructions up to the sterilization instruction. For example, it is not evident that "Step 8: Lubricate" in your reprocessing instructions has been validated. Please repeat your sterilization validation, if necessary, to validate all steps in your reprocessing instructions. Please ensure that you have used proper controls in your study to account for the presence of lubricant and potential false negative results.

f. It does not appear that you have validated the drying time for the steam sterilization method recommended in your reprocessing instructions. Please perform a sterilization validation study to validate the drying time by evaluating the dryness of the product by mass change and perceptible moisture, as described in ISO 17665-1:2006, "Sterilization of health care products—Moist heat—Part 1: Requirements for the development, validation, and routine control of a sterilization process for medical devices."

g. It does not appear that you have provided the results from bioburden enumeration and resistance or a description of your routine bioburden monitoring with action/alert limits. Please perform and provide results, including % recovery efficiency and recorded colony forming units per device, from a bioburden validation study in which the bioburden is enumerated on heavily soiled, clinically used devices after exposure to minimum cleaning parameters. Please also develop methods and alert limits for routine bioburden monitoring, and provide a description of these methods and alert limits with your response. Finally, please perform a bioburden resistance study using a fractional sterilization cycle to confirm that natural bioburden contained on the reprocessed device is less resistant that the biological indicators used in the sterilization validation and those used for routine cycle monitoring. Please reference and cite applicable standards where appropriate (e.g., ISO 11737-1:2006 /(R)2011, "Sterilization of health care products—Microbiological methods—Part 1: Determination of the population of microorganisms on product").

Biocompatibility

The following deficiencies refer to the biocompatibility testing that you have conducted to validate your remanufacturing process. Please refer to the Blue Book Memorandum #G95-1, "Use of International Standard ISO-10993, 'Biological Evaluation of Medical Devices Part 1: Evaluation and Testing'" (available at http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm080735.htm), for additional information.

33. On page 2 of Module G, you state that the Remanufactured Fenestrated Bipolar Forceps and Remanufactured Monopolar Curved Scissors were selected as the two representative device models for Biocompatibility testing. Through email on May 15, 2015, you state:

> "Each device did not contain all patient-contacting materials, but full coverage of added or modified material for all models was achieved by testing both of them. The table below outlines which materials are represented by each device tested. It should be noted that the ceramic heat sink that is present on the hook of one device model (420183) and spatula of another (420184) is never modified (polished or otherwise) or replaced during the remanufacturing process. As such, this component was judged not to pose any biocompatibility risk, as the stable ceramic material was clearly qualified as biocompatible as part of the OEM device, and is not later modified."

However, we do not agree with your rationale that the ceramic heat sink does not pose any biocompatibility risk. Although you claim that the ceramic heat sink is "…never modified (polished or otherwise) or replaced during the remanufacturing process," the heat sink is reprocessed multiple times throughout the lifetime of the device. Due to the harsh nature of reprocessing agents, repeated reprocessing and use cycles may cause the ceramic to degrade or exhibit other adverse effects over the course of the device's lifetime. In addition, an aspect of the biocompatibility testing for a reusable device is to evaluate residual cleaning agents used during reprocessing.

Therefore, please perform testing on either the Remanufactured Permanent Cautery Hook (420183) or Remanufactured Permanent Cautery Spatula (420184) to demonstrate the biocompatibility of the ceramic heat sink. As noted in Deficiency 35 below, this testing should be performed at the end of the remanufactured device's use life (i.e., after being subjected to all remanufacturing procedures performed under worst case conditions, followed by worst case reprocessing for at least 11 cycles). In your response, please provide a complete description of the methods used to prepare the test samples prior to biocompatibility testing. Please also provide the full biocompatibility test reports for these devices, including a description of the test article, methods, pass/fail criteria, and results for each completed test.

34. The list of "Parts and Materials" on page 43 of Module E, Sterilization, lists "Steris Hinge Free Lubricant." As also stated in Deficiency 25, there is no further explanation provided with Attachment E; therefore, it is not clear how this lubricant is used or if it is applied onto a patient-contacting portion of the subject device. Please clarify if this lubricant is used on any patient-contacting portions of the subject device, and clarify if this lubricant is present on the devices used in your biocompatibility testing.

    Furthermore, it appears that the Steris Hinge Free lubricant contains dimethylol-5,5-dimethylhydantoin (DMDMH), an antimicrobial preservative agent that is a formaldehyde releaser. If this lubricant is used on your subject device, please provide an MSDS and toxicology information to demonstrate the safety of this antimicrobial-containing lubricant. FDA is concerned that the presence of this antimicrobial lubricant on a patient-contacting portion of the device may lead to transfer of the lubricant to the surgical site where it could be in contact with tissue for longer than the 24 hours used to establish your biocompatibility testing. In addition, the presence of DMDMH raises concerns about potential genotoxicity and carcinogenicity. Please individually assess each of the chemical components in the lubricant used on your device and provide a toxicological risk assessment in accordance with ISO 10993-17, "Biological evaluation of medical devices – Part 17: Methods for the establishment of allowable limits for leachable substances." Please provide a tolerable intake analysis based on: (1) published no observed adverse effect level, (2) lowest observed adverse effect, and (3) an adequate safety margin as specified in ISO 10993-17. This information is necessary to establish substantial equivalence, in terms of safety, to the predicate device.

35. Through email on May 15, 2015, you describe the selection and preparation of the Remanufactured Bipolar Forceps and Remanufactured Monopolar Curved Scissors for Biocompatibility testing. You state:

> "Worst case devices chosen for biocompatibility testing were those devices that collectively contained all patient contacting materials that were added or modified by the remanufacturing process, and were exposed to all remanufacturing processes that would be relevant to any individual model."
>
> You further state, "Previously used, expired devices were chosen for the testing, meaning that the device had been reprocessed a minimum of 10 times by the end-user. The devices were then subjected to our remanufacturing process which includes 2 additional reprocessing cycles (scrub, flush, ultrasonically clean and autoclave) for a total of 12 reprocessing cycles."

However, sufficient descriptive information is not provided for FDA to fully understand how the devices were prepared prior to biocompatibility testing. Although you provide a rationale for selecting the types of devices used for biocompatibility testing, you do not describe the criteria by which the individual test samples were selected for the study. Please explain how the test samples were selected for the study, and address the following items in your response:

a. A description of the reprocessing of the test samples by the end user prior to biocompatibility testing is not provided. Please provide a description of the reprocessing steps used on the test samples by the previous end user. This information is requested since changes in the OEM's reprocessing instructions could be implemented differently at the health care facilities and have a significant effect on the device's validated number of use lives.

b. The remanufacturing procedures in Attachment B of Supplement 2 describe the use of multiple agents (e.g., TheraBand, lubricants, rust remover etc.) that may contact patient-contacting portions of the subject device. Please clarify if the test samples were subjected to ALL of the remanufacturing procedures in Attachment B of Supplement 2, including all of the remanufacturing agents described therein. In your response, it would be helpful to provide a list of agents used during the remanufacturing process that contact patient-contacting portions of the subject device, and to describe any assurances for removing residuals from these agents remaining on the device after remanufacture. Please additionally see Deficiency 34 regarding use of the Steris Hinge-Free lubricant on the subject device.

Finally, according to your email on May 15, 2015, it appears that subject devices were tested for biocompatibility immediately following the remanufacturing process. It appears that the devices were not subjected to biocompatibility testing at the end of their remanufactured use life (i.e., after 11 additional cycles of worst case reprocessing.) Please be advised that the devices should be tested for biocompatibility after being

subjected to all of the remanufacturing procedures (following worst case tolerance parameters) in addition to worst case reprocessing for at least 11 cycles.

Therefore, in order to demonstrate that the subject device remains biocompatible throughout its entire use life, please perform biocompatibility testing on the remanufactured devices after at least 11 additional cycles of worst case reprocessing. In your response, please provide a complete description of the methods used to prepare the test samples prior to biocompatibility testing. Please also provide the full biocompatibility test reports for these devices, including description of the test article, methods, pass/fail criteria, and results for each completed test.

36. In Attachments G-9 and G-10 of Module G, you provide test reports for hemolysis testing on the Remanufactured Fenestrated Bipolar Forceps and Monopolar Curved Scissors. However, only extract testing was performed on these devices; direct contact testing was not performed. Please note that ASTM F756-08 states, "It is recommended that both tests (extract and direct contact) be performed unless the material application or contact time justifies the exclusion of one of the tests." Therefore, please perform direct contact testing on your subject devices, or provide a valid scientific rationale for why this testing is not needed.

37. In Module G, You provide biocompatibility test reports for the Remanufactured Fenestrated Bipolar Forceps and Monopolar Curved Scissors. However, the normal saline extracts for both devices were described as being pale red in color, turbid, and containing red flake particulates in the Irritation, Sensitization, and Acute Systemic Toxicity tests. Please provide evidence to demonstrate that the presence of color, turbidity, and particulates in the extracts are not indicative of problems with product manufacturing, and/or inappropriate extraction conditions that may invalidate the findings of the study. Information regarding the chemistry of the product may be helpful in your response.

Electromagnetic Compatibility (EMC) and Electrical Safety

The following deficiencies refer to the EMC and electrical safety testing that you have conducted to validate your remanufacturing process.

38. In Module I, EMC and Electrical Safety, it is stated that devices were cleaned and autoclaved a total of 11 times prior to testing, in accordance with the reprocessing instructions provided in Attachment F of Module I. Although the reprocessing instructions provided in Module I appear consistent with the reprocessing instructions provided to the user, it is not clear if worst case parameters were used to prepare the test samples (e.g., longest exposure times, highest chemical concentrations, and shortest rinse durations) in terms of the remanufacturing procedures, but also the simulation of reprocessing that the end user would perform. The instructions also do not include discrete temperatures and times for sterilization. Please repeat your EMC and electrical safety testing on end-of-life devices that were remanufactured and reprocessed under worst case conditions.

39. Although you provide a rationale for selecting the types of devices used for electrical safety testing, your electrical safety testing protocol does not explain how the individual test samples were selected for the study. Please revise your protocol to explain how the test samples were selected for the study, including their clinical use and reprocessing by the end user. This is information is requested since changes in the OEM's reprocessing instructions could be implemented differently at the health care facilities and have a significant effect on the device's validated number use lives (which in part is determined by the electrical safety testing performed on end of use life devices). This information should also be used to help develop your incoming device inspection criteria.

Performance Testing

The following deficiencies refer to the general performance testing that you have conducted to validate your remanufacturing process.

40. In Attachment E of Supplement 2, you state, "OEM-equivalent specifications have been derived from published OEM product information, in-house 'reverse engineering' activities, and the relevant requirements of applicable consensus standards." Since it does not seem possible to identify exact device specifications using these methods, please perform side-by-side comparative testing with the subject device and the matching OEM device model, and use a statistical comparison between the two devices to evaluate substantial equivalence. Please provide a copy of the full side-by-side performance testing report with your response.

41. In Module J of your original submission, you state that simulated use exercises were performed on the devices, and that each "exercise" was performed 72 times per simulated use cycle. You further state that the number 72 was derived from a survey of current users of the da Vinci system, including urologic, gynecologic, and thoracic surgeons. 60 was determined to be the high end number of manipulations/activations for any given function and a 20% safety margin (i.e., 12) was added to ensure each function would be exercised significantly more than would be expected in the field. Please provide a copy of the survey protocol and report, including the methods and full results for FDA review.

42. In Module J of your original submission, you provide protocols for the simulated use and reprocessing cycles that were performed on the device prior to each performance test. You state that "…each use cycle consisted of ultrasonic cleaning and steam sterilization according to OEM parameters…"

    a. From review of the protocols, it does not appear that defined or worst case parameters were used for the device remanufacturing or reprocessing performed on the test samples. For example, the steam sterilization parameters are listed as a temperature range, minimum exposure time, and minimum pressure, rather than discrete values. The ultrasonic cleaner temperature is also listed as a range. It is not clear why "OEM parameters" were followed rather than your own "worst case" parameters. All process tolerances for your own remanufacturing and reprocessing procedures should be defined, and treatment of the test devices should be based on the worst case tolerances (not the OEM parameters). FDA

recommends that worst case conditions in this case include longest exposure times, highest exposure temperatures, highest chemical concentrations, and shortest rinse durations; note that these worst case conditions are different than what would be expected for worst case conditions used for preparing test samples for cleaning validation studies. Please revise your protocol to have defined worst case parameters for the remanufacturing and reprocessing procedures, and provide results from a new study performed following this revised protocol.

b. Although you provide a rationale for selecting the types of devices used for performance testing, your performance testing protocol does not explain how the individual test samples were selected for the study. Please revise your protocol to explain how the test samples were selected for the study, including their clinical use and reprocessing by the end user. This is information is requested since changes in the OEM's reprocessing instructions could be implemented differently at the health care facilities and have a significant effect on the device's validated number use lives. This information should also be used to help develop your incoming device inspection criteria.

c. It is stated on page 42 of Module J that two deviations occurred during the performance testing following your protocol. Sterilization was performed by gravity displacement rather than pre-vacuum steam sterilization method, and the ultrasonic cleaner was maintained between 45-50°C.

    i. It is not entirely clear what deviation occurred regarding the ultrasonic cleaner (it is presumed that the temperature was maintained incorrectly, but it is not explicitly stated what the temperature was intended by the protocol). Please revise your protocol to provide a comprehensive description of the ultrasonic cleaner procedure and its effect on the results of the study, with the consideration that the conditions used in the study should be "worst case." If "worst case" conditions were not used, please repeat the study using all "worst case" conditions.

    ii. You justify the deviation that resulted in the use of a different sterilization method (i.e., gravity displacement rather than pre-vacuum steam sterilization) by stating that the device is not shipped sterile and the only need at Rebotix is for decontaminating units upon arrival. You also discuss the fact that less steam may penetrate the flush tube inside the shaft with the gravity displacement compared to pre-vacuum. Consequently, you repeated the flush tube testing with pre-vacuum steam sterilization; however, all other testing was performed after gravity displacement steam sterilization. You further state that this deviation "…is only an issue if Rebotix was claiming sterility after being subjected to the life testing." However, FDA does not agree with this conclusion. Please note that it is your responsibility to validate not only the remanufacturing and reprocessing performed at your facility, but also the reprocessing instructions provided to the end user. Part of this validation

includes validating the number of use lives stated in the labeling if the user is to follow the provided reprocessing instructions. Therefore, it does not appear that the number of use lives has been properly validated, since the steam sterilization method used in your protocols is not what is used in your own remanufacturing procedures or what is recommended in your labeling. Please repeat all use life testing using defined, worst case parameters for the sterilization method that will be used in your remanufacturing procedures and in your reprocessing instructions for users.

d. Section 9.10 of your performance test reports states, "On the 11th cycle step 4 of 9.8 will not utilize a Steam Autoclave cycle." However, there is no step 4 related to sterilization in Section 9.8 of the test reports, and it is not clear why the protocol will not include sterilization during that step. Please revise your reports to clearly explain the referenced statement.

43. In Module B, Device Description, you state that the remanufactured device shall harvest the original DS2505 memory device for use on the interceptor printed circuit board (PCB) assembly, Rebotix P/N PR1110-002. It is not clear if there are acceptance criteria to determine if the DS2050 memory device can be reused. Please describe your acceptance criteria for determining if the DS2050 memory device can be reused.

44. In Module J, Performance Data, Attachment J-1, the Monopolar Curved Scissors Cuts Test procedure describes cutting on chicken breast. However, in Supplement 2 Attachment C, PR3037 and PR3038, the Cutting Efficiency Test states that scissors are subjected to a cut test using TheraBand (simulated tissue) per DIN 58298. Please provide justification for this deviation from your SOP for the cutting performance tests. Please provide data to show that the use of chicken breast represents the worst case challenge for the Monopolar Curved Scissors. Furthermore, please provide a copy of the methods used in DIN 58298 so that we may fully understand your cutting protocol.

45. In Module J, Performance Data, Attachment J-1, Monopolar Curved Scissors Simulated Life testing appears to have been conducted without the use of the tip cover accessory. It is our understanding that in clinical practice, the Monopolar Curved Scissors must be used with the tip cover accessory. Please repeat the simulated life testing for the Monopolar Curved Scissors with a tip cover accessory in place, and provide the verification report.

46. In Module J, Performance Data, Attachment J-4, 13 Permanent Cautery Spatula (420184) and 5 Permanent Cautery Hook (420183) were used in simulated life testing. A total of 18 samples were tested to provide the level of statistical significance at 85% confidence of 90% reliability. However, this is a departure from the other simulated life testing, where a total of 22 samples were tested to provide the level of statistical significance at 90% confidence of 90% reliability. Please provide your justification for this departure (i.e., for using 18 samples instead of 22, and for accepting a lower level of statistical significance at 85%) for the Permanent Cautery Spatula and Permanent Cautery Hook.

47. In Module J, Performance Data, Attachment J-7, Life Testing Worst Case Analysis, you describe your use of 3 criteria in guiding the selection of 6 representative models for Rebotix Life Testing. When we reviewed the number of malfunction reports in FDA's Medical Device Reporting (MDR) Database, the Mega Suturecut Needle Driver was among the top 5 EndoWrist Instruments with the greatest number of malfunctions. Furthermore, it appears that your current Life Testing does not include an evaluation of suturing performance. Therefore, we recommend that you perform additional simulated life testing using the Mega SutureCut Needle Driver (420309). Please include an evaluation of suturing performance as part of this testing, and provide the verification report for Simulated Life Testing for the Mega SutureCut Needle Driver in your response.

48. In Module J, Performance Data, it is not clear how the RF activations parameters of Power Setting and Duration for energized instruments were selected in the RF Activation (9.7) and Post Testing/Inspection (9.11) procedures. Please provide a rationale to demonstrate that these RF Activation parameters represent worst case conditions for the simulated uses.

49. In Module J, Performance Data, it is not clear if jaw alignments are checked for graspers, forceps, needle drivers, and scissors during Post Testing/Inspection (9.11). We believe jaw alignments are critical performance characteristics for these instruments and should be evaluated following simulated life testing to verify that the jaw mechanism can withstand all additional remanufacturing, reprocessing, and reuse cycles. Please address the following issues:

    a. Please incorporate a jaw alignment inspection step during Post Testing/Inspection (After 11 Simulated Uses) for graspers, forceps, needle drivers, and scissors.

    b. Please provide objective acceptance criteria for jaw alignment inspection. A subjective criterion, such as "The jaw must be correctly aligned" in SOP PR3024, is not adequate.

    c. Please repeat the simulated life testing for the Monopolar Curved Scissors, the Fenestrated Bipolar Forceps, and the Mega SutureCut Needle Driver, and provide the full verification reports in your response.

50. In Attachment J-9 of Module J, you perform shipping validation on the subject device in accordance with ISTA 6 FED EX, "FedEx Procedures for Testing Packaged Products weighing up to 150 lbs." You further state, "Since three samples are required, 3 different models will be tested; the Monopolar, Bipolar and PK models, all of which are energized."

    However, ISTA 6 FED EX is not an FDA-recognized standard. Furthermore, a sample size of n = 3 devices does not appear to be statistically justifiable. Please perform packaging validation on a statistically justifiable number of samples. We recommend the use of FDA-recognized consensus standards for this validation testing. (A current list of these standards is available at

http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfStandards/search.cfm). We have found that the FDA-recognized standard, ASTM D4169-09, "Standard Practice for Performance Testing of Shipping Containers and Systems," includes distribution cycles that provide sufficient rigor for a variety of shipping and handling situations. In addition, we have accepted successful test data from packages subjected to Distribution Cycle 13 with testing at Assurance Level 1, as we believe this to be sufficiently rigorous.

51. You provide the IFU for the subject device through email on May 22, 2015. On page 3 of this IFU, Table 1-1 provides a list of environmental conditions for the subject device. This table specifies the temperature and humidity ranges for operating, storage, and transport of the subject device. However, testing to support the specified temperature and humidity ranges does not appear to be provided in the submission. Please provide a copy of the validation report to support the environmental conditions specified in the IFU. Alternatively, please remove this information from the subject IFU.